

The Rickman Godlee Lecture

General Topic

## The Social Impact of Biology

Biology - broad use

obviously zoology, botany, microbiology  
and aspects like genetics, animal behaviour  
ecology

but also applied biology

- agriculture
- medicine

and especially human biology

- obvious medicine + public health
- psychology ... education.

and will touch on sociology

such as politics, law, etc.

(2)

This classification shows how artificial many of our present ~~distinct~~ subjects are (or will look, in the future) ... and the complexity of the applied problems (because sociology is complex).

### Impact of Biology on Society

two main types : applied biology  
ie technology

: the way we think about ourselves  
and our place in the universe.

### Example for the Past

Agriculture : { - practice of primitive agriculture  
{ - rotation of crops

artificial fertilisers (chemicals)

improved strains + methods (hybrid corn)

(3)

- most agricultural machinery dependent on electricity and internal combustion engine.

This biological technology will often depend upon advances in other branches of technology (eg computers)

Results: to transform our whole civilization, by releasing more people from food production.

### Medicine

- Sanitation + public health generally
- antiseptics (making ~~large~~ <sup>extreme</sup> Surgery ~~possible~~ <sup>safe</sup>)  
and antibiotics, anaesthetics.
- Antibiotics and synthetic chemicals.  
(morphine ~ opium)
- many other detailed advances (vaccine + polio)  
rare genetic diseases.

(4)

Result: people live much longer  
are generally healthier

Suffer less from ! Aspirin

Ideas

One outstanding example - Darwin

- the bigger impact and the more important idea  
in biology (contrast quantum mechanics)

Two basic ideas

① Evolution, & a family tree of species,  
leading back to one or a few simple organisms  
especially  
many gaps, - the beginning is obscure - but  
no serious doubts about the scheme  
go often leads from less complex  $\rightarrow$  more complex.

② The mechanism of evolution - ie natural selection.

The survival of the best adapted to the environment.

needs - Geometrical replication

- mutation (= mistake), which can be copied)
- limited resources available.

Neo-Darwinism (Darwin + Mendel)

almost universally accepted.

most admit that the detailed evidence is

still rather sketchy

<sup>(it has been)</sup>

but - no "dilemma" can be established  
against it.

- no alternative theory has stood up to experimental test.

Moreover the <sup>detailed</sup> neo-Darwinism are also very

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Sabotage (eg

Moreover the "subsidary mechanism" are often complicated and subtle (eg. <sup>self =</sup> ~~self~~ mechanism of genetic interchange) and probably not fully understood.

Nevertheless Darwinism has removed the previous dilemma ~~prior~~ - i.e. how ~~overall~~ could evolution happen ~~at all~~?

No evidence for any overall "direction" in evolution - depends purely upon "chance" events + natural selection

Everybody knows about evolution but very few people have fully accepted it - as I hope to show.

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## Present State of Biological Knowledge

- Aristotle
- Italian anatomist  
+ Harvey
- Biological classification
- ~~the~~ microscope
- ~~the~~ experimental biology (hence physiology)

zolt certain biology - expt. embryology  
for example - Genetics (Morgan)  
- molecular biology.  
- animal behaviour (ethology)

### General description

- ① continually accelerating (e.g. number of biologists)  
Kantaike — explanation in biology  
② attack on all levels — concept of levels  
— levels  
— within

[molecular biology]

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due to ② solid "base" of knowledge provided by modern physics + chemistry

③ very powerful experimental methods ditto.

④ influx of enthusiastic workers.

⑤ What fraction of biology is now known?

Must answer: very small, especially at the higher levels.

e.g. in molecular biology <sup>the central</sup> ~~basic~~ problem already solved in outline: catalytic activity: enzymes of protein e.g. gene structure, replication

central mechanism (allosteric proteins)

more abstract

① the action of memory

② the "contents of the visual image"  
to eyes moving.

Mechanism not known or even in outline.

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## The inmediation future of biological research.

many simultaneous advances, but in particular

### ① cell biology

- behavior of intact cells,
- interaction between cells to form tissues.

somewhat underpopulated

current molecular biology - overpopulated.

simultaneous discovery

"classical" experiments not  
adequately repeated.

~~moreover~~ moreover experiments

we can predict both people + methods will

move in from molecular biology (happening already)

more likely to continue.

(2) The Nervous System

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structure of organs  
individual part.

of especial interest to us as persons.

"romantic appeal"  
the motivations of  
Scientists.  
- living - non-living.  
- fundamental particles.  
- cosmology.

but perhaps somewhat slower progress

present lack of technical aids (e.g. mapping nervous  
connections . . . etc., But . . . )

Attack from ab. roads

from embryology (how nerve gets in the  
right place)

to artificial intelligence

etc. e.g. pattern recognition

a subject as the one right.

(11)

Thus certain that as biological knowledge is increasing rapidly, will continue to do so even more rapidly, and

what effect will this have on society?

### Present Problems

now all too familiar.

① population explosion.

also because of backward countries  
standards of living, starvation etc.

but ~~long~~ in the long term acute for  
everybody - just a matter of time  
problem of optimum density.

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② Aging - more and more old people.  
esp. more & more sick / semi old people.

problem will get worse:

- incase - care for cancer
- care for various heart disorders,
- care for strokes.

extensive organ transplants.

but ~~we~~ "can't" transplant heads.

when care for scarcity - many more sick  
people.

④ ③ often topics - pollution.

only partly  
biological  $\rightarrow$  { water pollution  
organic, except  $\rightarrow$  { air "

chemical pollution of animals, soil  
especially drugs, <sup>addictive</sup> ~~cannabis~~, LSD, alcohol,  
especially affecting the mind.

dangerous drugs: heroin,  
addictive

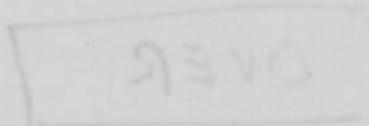
joke about  
ACID

③ organ transplanting  
black market in organs?

for artificial organs eg kidney machines.

- limited supply?

- cost?



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## Future Developments

E. Rutherford Taylor "The Biological Time Bomb"

Some details incorrect.

many <sup>topics</sup> ~~topics~~ ever of he does deal with these  
raise & topics ~~extensively~~ as extensively.

examples : mosaic & super & basic research

~~present research~~ =

① Mosaic mice - Barbara McClintock

black & white - before people.

principle of reusing the early embryo  
& replacing

eg. ② : sex determination. Edwards & Gardner.  
(rabbits)

③ : ~~Woolly aphid~~ ~~Red~~ ~~potato~~

transplanting nuclei, ~~base~~ — Briggs & King  
imp. from adults to eggs.  
in clones of people (as for plants )

④ mixed species <sup>homo culture cells</sup> man, mouse,  
for organisms. no man-mouse hybrids?

(14)

(15)

(4) Genetically engineering - altering genes

- tampering genes by viruses

both look rather difficult.

but Selective breeding (common agriculture)  
+ drugs

(5) new drugs (or techniques.)

- to make people more intelligent

- to make babies - - - .

- to make memory better

(RNA : feeding protein)

- to control mood, without

addiction or side effects

(aphrodisiacs!)

(15)

Other than biological discoveries now & in the  
near future will have an enormous social impact

What should we do?

Main theme of lecture

① We must start to think about these  
problems now

② <sup>Many of us</sup> need a ~~totally~~ new outlook to  
deal with them.

The Modern Scientific view of the world

(Hume, Burleigh)

: man occupies a minute part of the universe  
and has only existed for a minute space of time.

Thus man was unlikely to be unique  
or preordained

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- : Man has evolved from ~~lower~~ creature by a random process - no evidence for design in the universe, except in the very broadest sense.
- : lower creatures can almost certainly be understood in terms of the complex interaction of atoms and molecules obeying the laws of ~~physics~~ physics + chemistry - when a special case biology or is natural selection
- : it is at least probable that higher creatures + man can be explained in the same way

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: Man is different from other animals in certain particular - all of degree rather than kind.

① language

② able to handle abstract concepts

③ the extensive use of tools.

This leads to cultural evolution, which is

very much faster than evolution solely by

natural selection

: Man, mostly genetically evolved under conditions very different from those of today and ~~ever~~ " "

especially from those of tomorrow. No reason

to suppose him particularly well-adapted to ever ~~be~~ to his present environment.

(18) A

It follows then that the traditional rule of conduct  
~~the commandments should not be followed~~  
are unlikely to be of much use — as the  
best hypothesis or rather hypotheses =

Moreover the traditional foundations of these

are unacceptable:

- revelation from some supposedly divine <sup>divinely - inspired</sup> <sub>prop</sub> person
- eg. - life after death  
    ~ or transmigration of souls.
- an outside power who can be  
unfailingly communicated with by prayer

These hypotheses have no worth-while experimental  
support (that are theoretically unlikely and)

ridiculous to base important decisions on them.

~~BB~~

(B) B

(Time scale)

How acute are these problems.

Could be "acute" for two reasons.

① of catastrophe is sudden & very  
intense (like atomic bombs)

could be

② Burnells ~~worry~~ <sup>worry</sup> - the accidentally  
very nuclear weapons  
(should take precautions)

③ biological warfare : as ever present  
danger - needs more attention

but ~~not~~ as the moment all the  
major powers appear to regard it as a  
very poor weapon.

part of the larger problem of war

~~26~~

(18)-c

The organisation of world-wide society.

② effects can be irreversible.

e.g. the extinction of whales  
or other species.

danger to a habitat not so bad as  
destroying a species.

But in short time-scale is not <sup>very</sup> acute.

This problem apt to be neglected.

but nevertheless Because of our lack of

fore sight these problems are on top of us now,  
and the situation will get worse.

But do these general ideas matter?

Population examples:

Population : quantity control

Suppose ~~except~~ no wanted children were born  
(This contradicts catholic doctrine already)  
unclear what net reproductive rate ~~would~~ would be  
- almost certainly culturally conditioned.

Raisers : have people  $\leftarrow$  right to have ~~the~~  
as many children as they please?

the answer must surely be no.

- so how do we decide?

Population - quality controller.

Should thalidomide babies be allowed to live?  
- - - (nursing)  
Should <sup>1</sup> blind . - - - - ?

Other deformities ~~are~~ should be allowed - and

## Some examples

- The contraceptive pill and its problems
- Pioneers wanted contraception to avoid unwanted children or for family reasons, for its mother.
- Margaret Sanger asked Pilsbury for an oral contraceptive.
- Developed by commercial firms.
- Accepted for ① family planning ② sex outside marriage.
- Main need now to reduce population growth.
- religious opposition : the Pope.
  - especially bad in S. America (doesn't make so much difference - except
  - illegal in certain countries (France?) nonconscience + guilty
  - among best Catholics in advanced countries)

who should decide?

(Since the quantity more than adequate, why not increase the quality.)

Leave it to Doctors?

Guidance from society?

The voice of the patient?

Should we not do research to diagnosis or birth severe defects.

AId People

When should people be permitted to die?

vegetable people - turns off the oxygen.

how borderline cases. — very unhappy people  
in great pain  
— who want to die.

& we cannot continue to regard all human life

as sacred - depends on the quality

also already exceptions: killing people in war.  
(except for pacifists)

(21)

Should people babies only be legally born when

they are 1, say, 2 days old - we have to

make an acceptance test by society.

[ - we do this for motor cars - why not for people? ]

Should we have "legal death" (like legal  
at say 80 or 85?

(comes at age). Doesn't mean you have to

die then! Merely means that certain expensive  
medical treatment is no longer available to you.

May be sensible to distribute property or their

age and have a "second childhood" in the

case of either society or the one family.

ask how much is it worth to keep ~~sick~~

someone alive?

(22) A

## Nature - Nature problem

Awful need of information on the general assumption that education is all important.

- nonsense. ~~This~~ Criminals with abnormal

chromosome complement.

Need more studies on <sup>identical</sup> twins separated at birth.

So why should not all twins be separated at adoption early

birth? (not necessarily compulsory, but social

pressure + financial inducement) or drop to

produce more twins?

Lessen the effects of conscription.

(22)-B

These examples show we need new attitudes.

How do we obtain these?

- more rational discussion needed now.
- recently a crop of books and articles (some in press) on the subject.
- note those people who study the future (committee for the year 2000 f., etc)  
main emphasis on ~~present~~ non-biological technology & economic studies.

Real danger their people won't will ignore the  
law if they think it's illogical, &  
unnecessary & restrictive

e.g. - prohibition of alcohol (in USA)

- divorce laws - mainly by collusion.

(22) - C

modern example : cannabis

- really a tranquilizer in moderate doses
- dose controlled smoking : ~~instant~~ <sup>instant</sup> effect = instant effects over control dose
- almost certainly hamless or the ~~far~~ <sup>far</sup> more  
endemic : very unlikely to be seriously  
dangerous (u. probably less than alcohol)
- widely used, especially by young people
- present law ridiculous - how <sup>law</sup> police into corruption.  
penalties excessive  
could put ~~the~~ Person in gaol.
- More record needed  
BUT present position is bad in itself.
- Better to legalize now & regulate the  
quality and its sale.
- this makes it even less likely to lead  
to heroin addiction - u no pushers.

22 (22) D

Ban objects to cannabis & probably c  
igarette objectives.

Suppose a psychoactive chemical  
was produced with - no additive properties  
- no bad side effects  
- only very mild psychical  
addiction (aspirin)

Would ya object to it.

Thus, probably need to change attitudes,  
and this is a long process because ~~the~~  
~~base~~ for a radical change we have  
to go back to the children.

Lower class religious education - in schools  
or the BBC?

These chapters show we need new attitudes.

~~How do we obtain these? DIVERSE~~

Christianity → may be OK between  
consulting ~~an~~ adults in private

~~but~~ should not be forced ~~on~~

~~but~~ should not be taught to young children

Instead should be taught:

(a) the modern scientific view of man's position in  
the universe — at least the factual outline

(b) the extent of <sup>people's</sup> ~~their~~ dependence on society  
— in simple terms ~~by practical example~~

eg. Where their food comes from?  
more advanced  
civics civics

(c) the methods by which science arrives at the  
truth of science & not dull accounts of  
science dogmatically taught.  
UFO.

- more rational discussion of these issues.

- recently a crop of books and articles  
(some in progress) on this subject.

- people who study the future  
(Committee for the year 2000 ETC)

mainly technological & economic changes started.

- design of people taking the law into  
their own hands:

cannabis

examples of cannabis hash (marijuana)

- really a tranquilliser in moderate doses if it smoked.

- almost certainly harmful on the present evidence

- unlikely to be seriously dangerous for less pot. less  
than alcohol)  
don't drink people.

as soon as  
possible.

"leads to  
heroin"

avoid  
pushers.

- needles used, especially by young people,  
present law is ridiculous 1 hour the law & the police  
use contempt. More research needed for sensible to regulate supply

Not only need to get rid of our Christian  
preconceptions,

but also many liberal ones.

Stoberry reader:

- (a) that men born ~~and~~ over unequal
- (b) there very difficult to make them all equal
- (c) that it would be highly undesirable.

Some diverse diversity is necessary

so as as insurance against the  
future. — but meas' may not be in  
the right place

By no means clear that all races are equally gifted.

Nevertheless both liberal ideas are not necessarily wrong  
and more than Christians should be prepared to steal  
ideas — Hippies - early Christians.

In view of Biology or our idea of ~~ourselves~~

(can deal with this only briefly)

Mainly when we understand the nervous system.

Predictions will be ~~shocking~~ overwhelming.

e.g. will reach nonsense of much of our literature which will read like alchemy to a modern chemist.

But by the time practical problems will have made a considerable change in our ethics etc.

~~However~~ Moreover as we learn more & more

about human behaviour we shall have to continually adjust our ideas.

(A) (26)

## Cochrane

The impact of sickness on society has in the past been considerable. ~~as a~~ The rate of this impact is likely to increase drastically and to become overwhelming, both on the practical side and on the ~~our~~ picture of ourselves.

So I conclude that we must start now to discuss this problem, to ~~the~~ look to the future, to take steps to deal with it. Then in particular we need a new ethical system based on modern science.

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Should always remember that in effect the old ethical systems came out of people's hearts, too,

But they didn't leave out scientific knowledge.

and they operated in a different environment.

One man cannot answer all these

questions. Many years of difficult + painful discussion is needed by many people. ~~All I~~

~~wish to do is to bring them to you~~

attention - not to provide All I wish to

do is to bring them to your attention - ~~not~~

of course not to provide ready-made  
attitudes or answers.